THIS DOCUMENT IS A DRAFT

MERITS
Volume 2: Trainer's Guide

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Preface

List & explain all four MERITS volumes: repeat same text in each volume preface

1. Introduction

To administer a Mine Emergency Response Interactive Training (MERITS) session effectively, you need basic computer skills and knowledge of mine emergency response regulations and procedures. You will observe participants as they work through the exercise and use your observations, along with a computer-generated log of events, to conduct a post-simulation debriefing. This guide will explain what you need to do to prepare for and conduct a MERITS session. Do not allow trainees to read this guide prior to the session. For a general overview of MERITS, see Volume 1. For detailed instructions for using the software, see The MERITS User's Manual: Volume 3.

1.1. Is MERITS right for your class?

The simulation was developed to prepare individuals who may hold leadership positions in the command center during a mine emergency. It is also an effective tool for teaching other mining industry personnel about the complexity of a large-scale mine emergency response. While the simulation is set at a small underground bituminous coal mine, it has also been used to train personnel from underground stone and anthracite coal mines. A range of individuals, including mine managers, mine superintendents, first line supervisors, state mine inspectors, rescue team members, fire brigade members, safety committee members, and engineers have been trained with MERITS. Their response has been very positive. The primary consideration for selecting MERITS for a specific group should be their interest in, or need to know about, a large-scale emergency response.

Class sizes of three to five people have been found to work well. Classes of up to eight mine rescue team members have proven to be manageable, but in these larger groups some trainees were reluctant to interact. Sessions last approximately five hours. Of course, the length of the introduction and debriefing will vary with different instructors and trainees. The class length will also vary based on how the trainees progress through the exercise once the simulation starts. The simulation runs in real time (i.e. during the simulation, the time it takes to complete a task equals the time it would take in real life) so if trainees order supplies, call in additional employees or ask employees to travel to the mine's supply yard they will have to consider how long fulfilling such a request will take to accomplish. Computer skills are not needed by the trainees if you have someone assigned to operate the keyboard. This will be explained thoroughly later. In summary, an ideal MERITS class will have four participants who are interested in large-scale emergency response at underground coal mines and will last approximately five hours.

1.2. What will trainees learn?

MERITS allows a trainee to gain practical experience as a command center leader. Although actual emergency situations cannot be created for training purposes, a simulation such as MERITS creates a useful approximation. Trainees can make decisions and test theories in a potentially stressful but risk-free environment. They will learn the value of planning and see how anticipating needs during the response creates a smoother operation with greater control over events. Trainees will also see that actions must be taken within specific time frames and in proper sequences. You or other observers will be able to assess the skills and abilities of trainees in dealing with complex, stress-inducing situations.

2. Planning a MERITS Training Session

The best way to become comfortable with MERITS is to practice with the simulation prior to leading a class. By doing this, you can test the functions of the simulation and be prepared to assist trainees as they learn how to interact with the software. Taking time to review the program will also help you determine whether you will be able to lead a class alone and, if not, what kind of assistance you will need. All field tests of MERITS were run with at least one assistant. Often, the assistant's key role was operating the computer and being proficient at the functionality of the program. While this is not required, it leaves the trainer free to focus on observing and interacting with the trainees. It also frees trainees to direct their attention to the decisions to be made rather than the details of running the software.

You and/or your co-trainer or assistant will need computer skills and a knowledge of mine emergency response procedures and protocols. At least one person must be comfortable with using a computer mouse. A working knowledge of word processing programs and their basic functions (e.g. cutting and pasting items) and web browser tools (e.g. forward and back buttons) are also helpful. The computer operator will need to become fluent in the use of the MERITS interface (See the Volume 3: Users Manual for more information on this topic.). You will need to have a thorough understanding of mine emergency response. You will able to constructively evaluate trainee responses throughout the simulation and discuss them during the session debriefing.

2.1. Develop learning objectives

You should define specific learning objectives for each session. Clearly stated objectives will communicate to trainees where their attention should be focused. Defined objectives will also help you assess trainees' actions and decisions during the simulation and subsequent debriefing. You can select training goals for a specific class from the following general list:

Recognize a problem and identify who and what is at risk in a given situation

- The trainees recognize the potential for a hazardous event occurring based on initial cues.
- Given appropriate cues, the trainees shift from a normal state to a state of emergency.
- After an emergency has been recognized, the trainees immediately gather information needed to identify who/what is at risk.
- Using information gathered, the trainees determine necessary actions.

Implement a response plan

- Given an analysis of gathered data, the trainees implement the mine's emergency response plan (ERP).
- Given the ERP, trainees prioritize actions to be taken.
- Given the ERP, trainees place responders in appropriate locations at appropriate times.
- During the emergency, the trainees filter available information for usefulness.
- During the emergency, the trainees delegate tasks appropriately.
- After tasks are delegated, the trainees track progress and results.
- During the emergency, the trainees communicate the status/progress of the response.

Manage an emergency situation at a work site

- Given available information, the trainees determine a strategy for addressing the hazardous condition.

- During strategy implementation, the trainees define short-term and potential long-term response needs.
- During strategy implementation, the trainees reassess risk by reviewing the progress of the response.

After becoming familiar with MERITS, you may develop other teaching points and objectives that can be achieved with this tool. The key is to define objectives when planning each training session and then use these objectives to guide all subsequent aspects of the training.

2.2. Set up before the session

The layout of the training room is crucial to conducting a successful training session. Place a table that will seat all trainees comfortably near the front-center of the room. Trainees should be able to readily communicate with each other, work with written material on the table, and see the MERITS computer screen. The computer system requirements for running the software is defined in the MERITS User's Manual: Volume 3. Additionally, the following items are useful for conducting the session:

- Computer projection unit to display MERITS on a large screen in front of the room.
- Laser pointer to identify items on the projected computer screen to the keyboard operator.
- Pens, pencils, markers, and paper.

A link on the MERITS Home Page will lead you to PDF files of the information listed below. You should print out all of these files and make hard copies available to your trainees. One copy for each trainee is suggested. The following materials are also available through the interface before and during the running of the simulation.

- Mine Background
- Personnel (sorted alphabetically)
- Personnel (sorted by shift and usual work location)
- Roof Control Plan
- Ventilation Plan

There is also a link to a PDF of the mine's Emergency Response Plan (ERP). You should have at least two copies of the ERP available for the trainees to use during the session.

Figure 1–Typical MERITS session

If possible, you should have large mine maps printed on a wide-format plotter and put on the classroom wall for easy viewing by the trainees. Five maps can be printed for use. These include a general map showing all mine systems and attributes, and four maps with various mine systems (electrical, water, ventilation and escapeways) defined separately to make analysis easier. Blowups of the working sections can also be helpful. Trainees often want to put a copy of the working map on their table to write on as the session progresses. Like the information described above, the maps are available through the interface before and during the simulation.

Once you start the simulation, you cannot pause it. Just like a real emergency, there are no time-outs or break periods. If you anticipate that food will be needed by the trainees before the class is over, be sure to order it before you start the class. During field tests, trainees were often so immersed in the simulation they did not stop to eat lunch. One trainee commented - “Who can think about food now?” When there was a break in the action however, trainees and trainers were happy that lunch had been arranged ahead of time.

See the job aid at this end of this document for a checklist of the items covered in this section.

3. Leading a MERITS session

A MERITS class is divided into three main parts. In the first portion, you introduce the simulated mine, give an overview of the learning objectives, and explain how trainees will interact with the computer interface. Next, you start and run the simulation. The simulation portion of the class will vary from two to four hours based on trainee responses. Remember that the simulation runs in real time so the exercise will progress based on the time it takes the trainees to respond to particular events. After the exercise is complete, the final step is to debrief the trainees. The debriefing is a key part of the training. It is here that decisions are evaluated, choices are discussed with hindsight, and key learning objectives are reviewed. Guides for each of these class segments follow.

3.1. Prepare the class for the simulation

You need to introduce the simulated mine and the computer interface to your class. At this point, the trainees should be unaware of the nature of the emergency, or even if an emergency is what is being simulated. While much of the mine information available in the MERITS materials is not directly relevant to the specific emergency, trainees should evaluate all of the information to determine what is and is not important. At the start of a mine emergency situation, the ability to filter available information is an important skill. This is particularly significant for persons such as government officials and industry personnel from other sites who may be called to the scene, but who have not routinely spent time at the mine where the event has occurred. This situation can also be created when there is a disaster at a small mine where mine personnel may be too few to conduct the response. Relieve the anxiety of your trainees by explaining that you understand they are receiving a lot of information but that they will be able to learn enough about the mine to work the simulation effectively.

After you introduce the simulated mine, but before you explain the computer interface, give trainees time to review the materials at their own pace. Individuals with different expertise and experiences will find different aspects of the information more important and/or easier to understand. Be available to answer questions as they look through the material. Allow them to move around (or even leave) the room during this time. Encourage trainees to take a short break before you begin explaining the MERITS interface. The following sections will guide your session introduction.

3.1.1. Discuss the trainees' role

Tell trainees they are the superintendent of a small underground coal mine "Bottleneck #1." Inform them that they will collectively act as the superintendent and will work through the simulation from the mine office. The materials and maps distributed during the introduction provide the trainees with information a mine superintendent would have available in the mine office during an emergency. Once the emergency starts, the mine office also serves as the command center.

Since the trainees are acting as one superintendent, explain that they will work together in this role and that all decisions they make during the session must result from a consensus. One trainee should be named as the spokesperson for the group. Only the commands communicated by that trainee will be implemented by the keyboard operator. This reduces confusion when various trainees bring up multiple possible actions at one time. Having one spokesperson forces the group to discuss different approaches and settle on the best option. If you know your trainees well, select the spokesperson carefully. A very experienced and/or confident person is likely to take charge, causing the other group members to defer to his or her choices. A person with little or no emergency response experience and/or a quiet and reserved personality may be too uncomfortable in the role to perform it adequately. An ideal spokesperson is open to everyone's suggestions, but confident enough to provide the needed instructions to the keyboard

operator. Remind trainees that the spokesperson must communicate the decisions the group members make together in their joint role as mine superintendent.

3.1.2. Introduce the simulated mine

Set the stage for the exercise by reviewing the handouts discussed in section 2.2. Note: These handouts are available for printing as PDF files on the MERITS home page. They can also be viewed on the MERITS screen under the Documents heading of the MERITS toolbar. This will give the trainees a context for what they hear and see as the exercise unfolds. While discussing the information, use the interface to show it on the screen. Some important points about each handout are discussed below.

Mine Background - This handout provides information about the mine such as coal properties, the number of employees at the site, the number of working sections, equipment in use, and haulage methods. There is also a bulletin board where contact information for mine rescue teams and emergency medical services posted. Federal law requires this information to be available at all mine sites.

There are also maps of the local and extended community around the mine. When you show the local area maps explain that MERITS operates in real-time. This means that things take as long to happen as they would in real-life. For example, if someone is asked to bring supplies from the closest town to the mine site, the computer will calculate a reasonable time for loading and driving the supplies to the mine. The driver will arrive with supplies at that time. This teaches trainees to plan ahead and to anticipate delay times in implementing decisions.

Use the "Your Office" section to give trainees an overview of the information and tools that will be available during the exercise. Tell them their office is designated to become the command center in the event of a major emergency.

Personnel List - (sorted alphabetically by name) - This handout contains a list of all simulated personnel who work at the mine. It includes workers' names, job titles, usual work locations, and work shifts. Trainees sometimes say they don't want to learn the names of the mine personnel. Stress that this is vital to their success. Reassure them that they will be able to handle remembering the important names as the exercise progresses. At first, trainees will have difficulty recalling mine personnel. The ensuing confusion is appropriate and adds to the low-level stress of the training session. Avoid telling the trainees the names or positions of particular mine personnel, but do suggest ways to find the information (i.e., such as reviewing the personnel roster or writing down a list of people who are mentioned during the simulation run).

While this information is not on the hand-out, use the personnel list on the interface to show how to see each worker's qualifications and certifications. All miners have, at minimum, their miner's certification. Some have additional, specialized qualifications based on job requirements. For example, foremen have foreman's certification and might also have emergency medical technician certification. Maintenance personnel will be certified as electricians, while face workers (such as continuous miner operators) will have gas detection certification. Explain to the trainees that they will need to instruct personnel to perform tasks during the MERITS simulation. When doing so, they should select a miner possessing the proper certification to perform the work. Otherwise, the job will not get done.

Personnel List - (sorted by shift and usual work location) - This handout includes the same people as the previous one, but the personnel are sorted in a different order. It will help trainees to get familiar with mine personnel and make it easier to find people with certain job titles or in given locations.

Roof Control Plan - This presents information about the geologic conditions and roof control policies at the mine. Among other things, information on the main and immediate roof bolting plans, and type of supports are included. Have trainees review this plan to get an idea of the routine conditions at the mine.

Ventilation Plan - This presents information about the ventilation system used at the mine.The information that is provided includes fan information, section ventilation plans, and seal installation. Have trainees review this plan to get an idea of the typical conditions at the mine.

Emergency Response Plan - The first part of the ERP defines the mine's emergency procedures that should be followed. The remainder consists of contacts for providers of supplies and services and governmental organizations. The phone numbers given for each contact are recognized by the simulation. Explain to trainees that they can call any of these businesses or organizations during the course of the simulation. The list of contacts was developed to cover every emergency need. Stress the importance of having such information easily accessible at a mine site. This comprehensive ERP was developed with the assistance of the Commonwealth of Pennsylvania's Bureau of Deep Mine Safety.

3.1.3. Review the mine maps

Be sure all trainees can read and understand the mine map. Review the map legend and all symbols. Note that some of them may be different from those that trainees are used to seeing. Also show them the location of the two working sections (4 Left and 1 North) and the spare section (3 Left). Go over the mine's ventilation, water, and electrical systems. Point out the survey stations with numbered spads marked on the map. These spad numbers can be used to assist in communicating locations between trainees, trainers, and the keyboard operator. Also show trainees there is little pitch to the seam.

3.1.4. Explain the interface and the computer commands

If a keyboard operator will be used, explain that person's role and reinforce the fact that trainees must communicate decisions to the operator through the trainee chosen as their spokesperson. Even though trainees may not be controlling the computer, they need to be familiar with its functions and capabilities. You or the keyboard operator should introduce the interface. For detailed instructions on using the interface, see Volume 3: User's Manual.

The interface allows trainees to interact with the simulation through written communications. It consists of a number of web pages and methods for navigating through the MERITS scenario. A picture of a typical MERITS screen is shown in Figure 2. Most of the screen is the data area where information or tools selected by the trainee are provided. A toolbar is found across the top of the screen. The MERITS bar is down the left side. Icons on the left toolbar are selected to display reference material and logs that are needed to analyze and resolve the emergency situation. The currently-selected reference or log appears in the data area of the screen. For example, a page from the mine's ERP is shown in Figure 2.

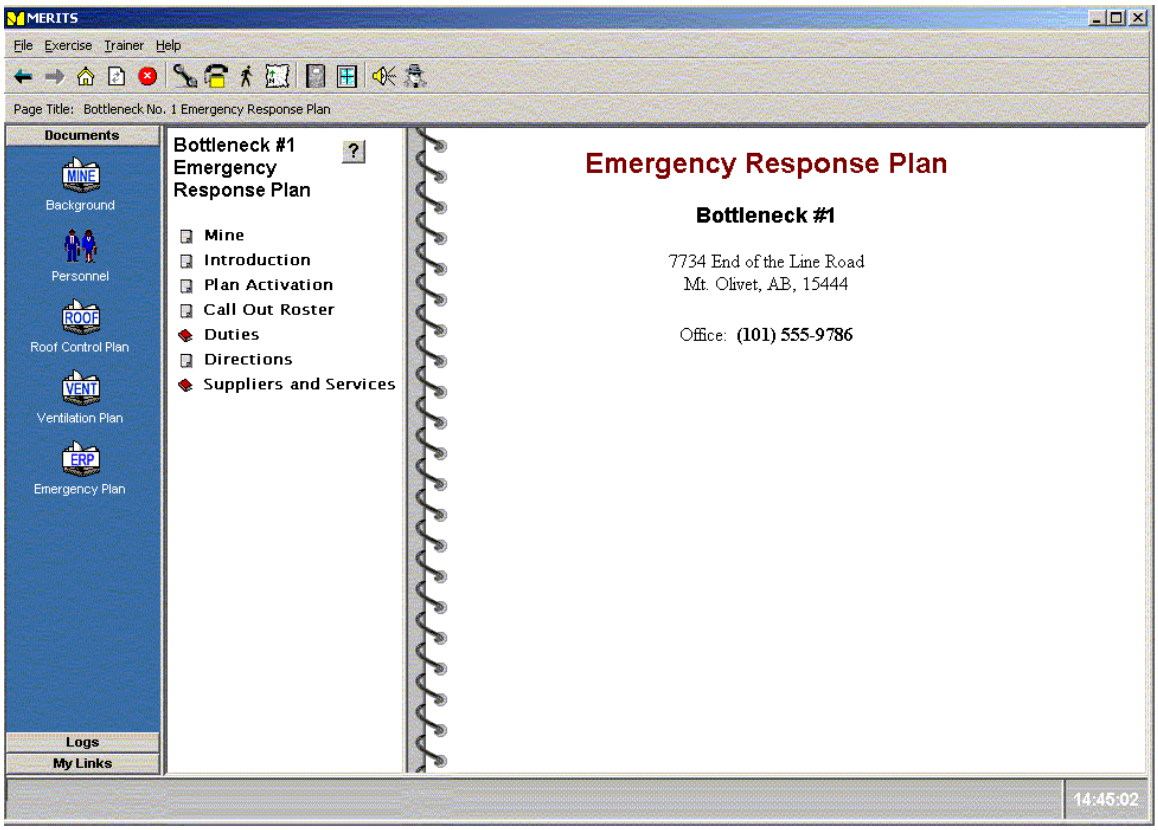

Figure 2–Typical MERITS Screen with ERP page showing

The MERITS toolbar contains icons that can be selected to view the information used to introduce the trainees to the mine as explained in section 3.1.2. Logs are also on this toolbar. Logs provide current information about the status of various things at the mine site as listed below.

- Shift Reports - The pre-shift and on-shift hazard examination reports are available for the day of the simulation and the previous day.

- Fan Charts - Fan and barometric pressures are given for the day before and the day of the simulation. These charts update as the simulation progresses.

- Surface Supply Inventory - This list details all supplies available on the surface of the mine. Position the mouse pointer over the name of an item to get more details about it. This list updates as supplies are used or delivered to the supply building or supply yard.

- Tag Board - (See Figure 3) This lists the names of all mine employees. An *In* tag is by the name of an employee when that person is underground. If visitors come to the mine and go underground, their names will be added to the board. During the simulation, the tag board will update as soon as people enter or leave the underground area of the mine.

- Notebook - Trainees can record any information they may want to keep for future reference in this notebook. Each note will be time-marked. Simulated mine employees will sometimes send audio

"reports" to the command center. These "reports" are automatically put in the notebook for later reference.

The following logs may be used during the simulation.

- Gate Log - When the trainees determine that an emergency situation exists, they should send someone to monitor the mine property gate. If they do, after the simulated person assigned this task arrives at the gate he or she will start a log of everyone who enters mine property. If this task of monitoring the gate is not assigned, no gate log will be available.

- Emergency Log - After trainees determine there is an emergency situation, they may assign someone to keep a record of everything that happens in the command center. If they assign this task, they will be able to review the log for information such as which commands were given at what time. This log will only be available after the task of keeping it is assigned.

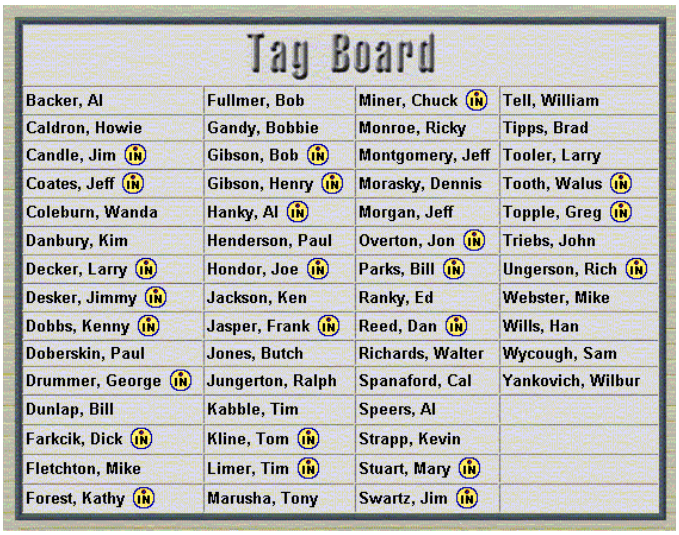

Figure 3– Mine Tag In/Out Board

The last area in the MERITS toolbar is called "My Links." In this area, links can be created to any website. You may want to place a link to MSHA's Homepage or to the Code of Federal Regulations on-line. Trainees can create links during the session to make it easy to refer to their pages later.

Tools that can be used to interact with the simulation are in the toolbar across the top of the screen. They allow actions such as making a telephone call to order supplies. When a tool is selected, a dialog box for that tool "pops up" over the data area of the screen requesting further information. Figure 4 shows the command box that "pops up" after the telephone tool is selected.

Figure 4- Telephone display

The tools listed below allow trainees to communicate with the simulation. These tools can be accessed at any point during the exercise.

- Telephone - There is only one outside telephone line available. Active phone numbers can be found in the personnel list and in the ERP.

- Mine Phone - This pager phone can be used to make calls to any mine phone on mine property. Any conversations on the mine phone can be heard by everyone at all mine phone locations.

- Runner - Any mine employee who is in the mine office can be assigned as a runner. Runners will do tasks or carry messages instructing other people to do things.

- Mine Map - A mine map is accessible at any time during a MERITS session by selecting the Map icon from the top toolbar. This is the same map as the paper version discussed earlier. It will appear as shown in Figure 5. Trainees can view any aspect of the map close up (using the zoom tool) as well as highlight and view locations of various components (i.e., SCSR caches, escapeways, etc.). Important locations can be saved so they can be easily found later.

- Briefing - This tool allows trainees to create work orders and briefings for mine rescue teams, families of victims, and the media. The briefings can be written and submitted right away or saved for later submission.

- People and vehicles on the surface - This tool is a ‘window’ that allows trainees to see the people and vehicles who are currently on the surface of the mine. This list includes mine employees and visitors.

- “Repeat last audio” and “Repeat last animation” - These options allow trainees to hear or view the previous communication from the computer. These communications can be audio messages over the simulated mine phone or given messages given by animated figures who appear on the screen. Only the most recent communication is available.

- Clocks - Before the simulation is started, the clock in the lower right hand of the screen shows the real time of day. After it is started, the clocks show the time of day in the simulation problem and the amount of time that has elapsed while the simulation has been running. The simulation always begins at 9:30 a.m. simulation time.

Help files are accessible at any time during the MERITS simulation by clicking the buttons marked with question marks or by going to the help menu. For more detailed instructions on using the toolbar see Volume 3: User's Manual.

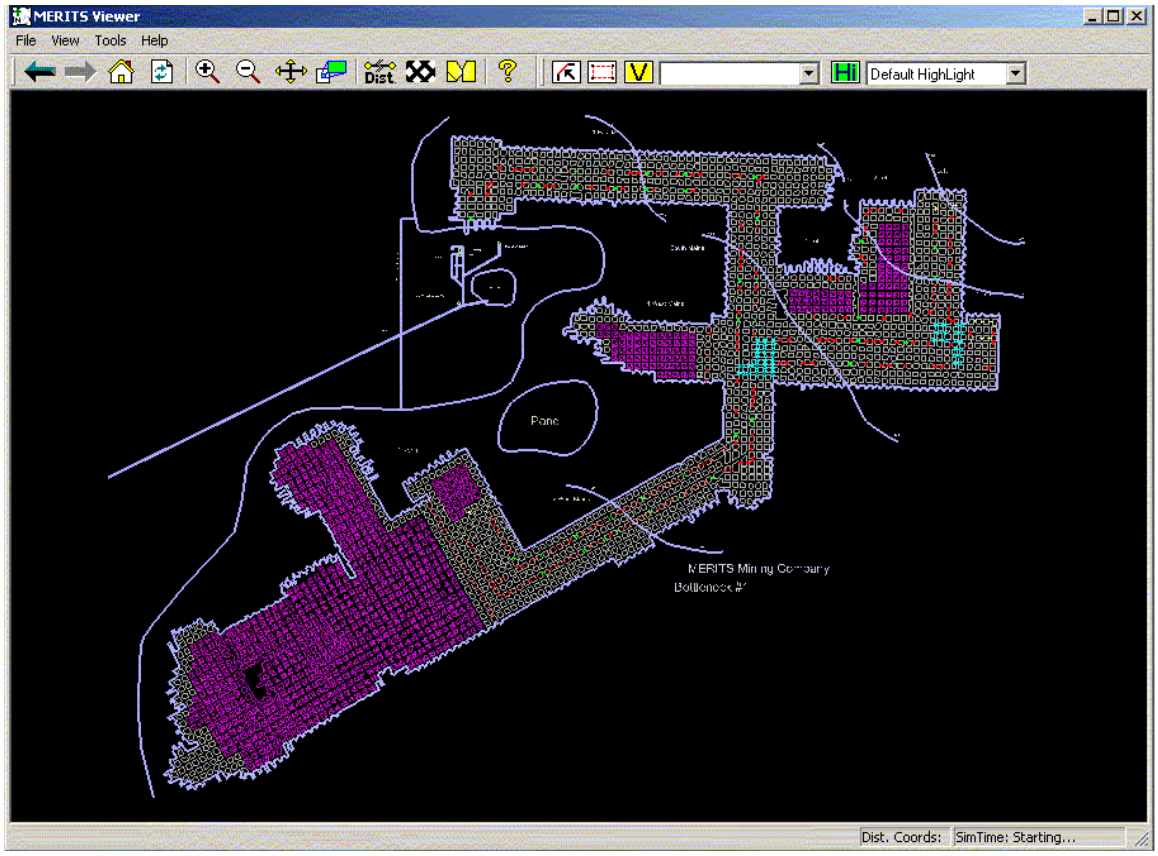

Figure 5- View of the Mine Map

3.2. While the simulation is running

The simulation runs for two to four hours (remember that simulation time equals real time). The length will vary based on when trainees take key actions, but there are some events that are scheduled to give the general timing and order to the story. This section outlines the events that will take place. Each run of the simulation will vary somewhat from others because of the choices of actions taken by the different groups of trainees. This guide is to give you a general idea of what to expect during the training session. Remember to take care not to give away key elements of the problem as the scenario unfolds. Storyline details found in the section below should not be known to trainees before they encounter related information during the exercise.

3.2.1. Getting the action started

During some simulation runs, you may not have to interact extensively with your trainees. Some people are comfortable with the computer simulated environment and have enough emergency response experience to work through the problem with little direction. Novices to computer simulation or to emergency response will probably need more attention and support as they work through the problem.

IMPORTANT: Be careful not to help trainees so much that you reveal too much information or that they don't get a feel for the complexity of a large-scale response . For more experienced trainees, it can be effective to add to their challenge by throwing out questions and suggestions that may or may not direct them to the solution. You can push these experienced trainees by asking them if they have certain kinds of information and requiring them to try to find it quickly. For example, a novice group may not think to account for everyone underground in early stages of the simulation and you might not want to introduce this question until there is a break in their activities. Then, you could help them find their employees. For a somewhat more experienced group, you may want to wait until they are not actively engaged in other activities and then suggest they account for everyone underground, but offer limited assistance. For the most experienced trainees, you could ask them if everyone underground is accounted for, including workers outby, while they are actively working on other aspects of the response. You will have to evaluate how your trainees are doing while the simulation is underway and then use the timing of your questions and your level of assistance to provide the appropriate level of challenge.

As the simulation starts, help the trainees to become comfortable working with the interface. The simulation clock will show the time as 9:30 a.m. and the simulation will progress in real time (hours, minutes) from this starting point. Give the trainees an opportunity to read the information presented on the screen and then continue helping them familiarize themselves with the mine. Suggest that they view on-shift and pre-shift reports. This allows them to practice using the interface and gives them information about the routine conditions at the mine. While they are reviewing this information, two requests will be presented to give them practice using the interface tools. The mine clerk will appear to make the requests (See figure 6).

- For the first request, Tammy will tell the trainees that the wife of Jim Candle (one of the employees working in the 4 Left section) called and requested that her husband be sent home because their child has been in an accident. To meet this request, trainees must identify Candle's work location (section) from the personnel list, call this work location using the mine phone, and issue a command telling whoever answered the phone that Candle needs to go home. Typically, trainees choose to have the person who answers the phone on the working section tell the supervisor in that area to send Jim Candle to the mine office (Note: after getting the message, the employee will either ride in a mantrip or walk to the surface, depending on the availability of transportation).

- In the second request, the clerk, Tammy, appears and asks that time sheets be signed. The trainee types a name in the box and exits the box to complete this task.

Figure 6- Tammy the Mine Clerk

Tell trainees they do not have to provide every detail about how the employee should leave the mine or how the supervisor should operate the section without that employee. The simulated employees will make

these kinds of decisions without direction, as in the normal operation of a mine. When the employee is out of the mine, trainees will see his name appear in the list of available runners in the mine office. His tag will also be removed from the tag board when he exits the mine. After completion of these tasks, trainees will have seen the mine clerk and should have searched for information about personnel, viewed the tag board, and used the mine phone with its related command box. When not working on these tasks, trainees often return to the shift reports to continue looking for clues as to what may happen later in the simulation.

Early in the simulation, background chatter is heard over the mine phone - typical of the type that would be heard at a mine. This is routine talk about the location of supplies. There is also a conversation about a fire sensor that has been malfunctioning and needs to be repaired. Trainees shouldn't become overly concerned when they hear this discussion, but they should take note of it. When they later hear about the possibility of a fire underground, they should recall that their fire sensor system may not be fully functional. The chatter on the mine phone becomes an annoyance after it becomes clear that there is a problem underground. Trainees can request that everyone clear the phones except for emergency communications.

3.2.2. During the emergency

The first indication that something is wrong comes from a motorman who reports that he smells smoke near the mouth of 2 West Mains. The trainees should become alert at this point. After this, your level of interaction will depend on the expertise and needs of your trainees. It is important to allow them to fully discuss options and even to make mistakes that might result in outcomes that will teach them important points. You should, however, assist them if they do not seem to be progressing. Some groups of trainees have trouble getting started and need close oversight at first. Others jump right into their role and need little trainer interaction. Shortly after reporting that he smelled smoke, the motorman will report that he has discovered a fire. At this point, the trainees should start taking action.

Trainees usually are concerned with getting a warning to miners inby the fire in the 1 North section. They should try to do this, but will not be able to as the phone lines have already been damaged by the fire. **Do not** tell them about the phone line failure this early in the simulation run.

There are basically three options for what trainees might do about underground miners who are outby the fire in 4 Left.

- First, some trainees want to immediately evacuate the entire mine to the outside. You may want to discourage novice trainees from taking this option. If they evacuate at this point, there will be a delay in controlling the fire because there will be too few miners available at the scene.
- A second possibility, which is often considered the best, is to send 4 Left miners to assist with fire fighting.
- A third option that is midway between these extremes is to send the 4 Left miners to some location closer to the fire area to wait for further instructions. If trainees send the 4 Left crew to an area that is not close enough to hear the mine phone, they will not be able to call the crew later and will lose valuable time sending someone to get a message to these miners.

If trainees do not send any message to the 4 Left crew, the miners will eventually decide to go to the fire area to help and will report that they are taking that action. Whether they are sent by the trainees or make their own decision to go, the miners in the 4 Left working section will take all available fire fighting

supplies with them as they go. After reaching the fire scene, miners will be not able to extinguish the fire, but will be able to keep it somewhat under control. These two tasks, sending miners to fight the fire and attempting to contact the miners inby, are the only actions the trainees need to be taking related to the underground portion of the problem at this point. Often, trainees with mine rescue experience will want to focus on the underground problem at the expense of the surface coordination activities. If this happens, you may want to encourage them to take a larger perspective in their approach.

After trainees have confirmed that there is a fire underground, some surface coordination and response activities should be started. One important but often overlooked task is to call and inform the corporate office of the situation. Unfortunately for the trainees, many of the corporate officials are away from the office, but those who are there can be asked to come and assist with the response. Experienced trainees often give the corporate person the duty of dealing with any media who might arrive. The sooner this call is made, the sooner there will be some corporate assistance for this or other tasks.

Usually, the first call trainees make is to ask for mine rescue teams to come to the property. A number of later events are tied to the arrival of the mine rescue teams, so the sooner the mine rescue teams are called, the sooner the situation will be resolved. After the call is made, trainees sometimes become impatient waiting for the teams' arrival. Remind them that in a real-life mine emergency, it is likely to take hours to assemble teams and have them travel to the site. It may seem like a long time before the simulated teams arrive and are prepared to go underground, but in reality the simulated teams are prepared to respond much more quickly than would probably be the case in a real emergency situation.

Another call that is frequently made early in working the problem is for emergency medical assistance. Trainees can call a specific ambulance service or 911. If they use the 911 option, police will also be alerted. If not, they will have to make a separate call to the police. When the police arrive they will direct traffic on the road to the mine and provide security at the mine gate.

Even if the police have been contacted, trainees should be setting up their own site security at the same time. As soon as local emergency services of any type are called, trainees should assume that citizens in the local area know about the problem and some of them will come to the mine. Unauthorized people can be kept off mine property by sending someone to guard the gate. The gate monitor will also begin a Gate Log that trainees can reference to determine who has entered mine property and/or who is being held at the gate.

During an emergency response certain tasks have priority over others, but all necessary tasks should be completed in a timely manner. The simulation is programmed to deliver cues (either from a simulated individual calling over the mine phone or from an animated employee who appears on the computer screen) if the following tasks are not completed within set time frames:

- calling MSHA
- calling the state mining administration
- calling for police
- calling mine rescue teams
- setting up to deal with the media
- setting up to interface with the families of endangered employees
- getting food for the responders.

While they are working on the surface response and external coordination and requests, trainees should continue to be aware of the situation underground. They need to keep track of the locations of employees.

They will be given updates on the status of the fire, the roof conditions in the fire area, and gas readings from that area routinely. If trainees want additional readings or readings taken at locations different from those routinely reported, they can use the mine phone to request additional information or send a runner to get the information.

Trainees should send someone to monitor the mine fan. If a miner with gas detection certification is given the command to monitor the fan, he or she will stay at the fan and routinely report readings back to trainees. As in all cases, if the miner selected does not have the certifications to do this task, he or she will not be able to perform it. After the fire is discovered, a fireboss comes into the office. He had been performing the weekly examination on the intake escapeways and did not know there was problem underground. Trainees often assign him to monitor the fan since he is readily available.

Based on the information they are given, trainees may want to make a ventilation change. They can do this by using the mine phone to give a command to someone underground to go and open or close a specific door. Whether this is the correct action should be discussed during your debriefing.

After two mine rescue teams arrive and are briefed, they prepare their gear, travel into the mine, and set up a fresh air base. When the fresh air base is established, one team starts inby to look for the missing miners. Trainees do not need to give step-by-step directions to the advancing team, but should provide the location of the missing miners, to the best of their knowledge, by submitting an updated rescue team briefing. The advancing team will decide the best route to take to that location. As it progresses, the team will report back location, gas readings, and low-man oxygen readings routinely. When the rescue team has found the missing miners and brought them back to the fresh air base, the problem ends. All miners should be accounted for and at a safe location at that point.

Trainees may question the location where the missing miners were found and say it is unrealistic that miners would evacuate by that route. Explain to them that the actions of the miners in 1 North were modeled after the experiences reported by miners who have escaped actual mine fires. In real cases, miners usually gather at the location where they would gather at the end of a routine shift. They are likely to ride vehicles if at all possible. And like the miners in the simulation, they think there are good reasons not to stay in the intake escapeway. Rescues should be planned with the expectation that miners may not follow the mine's official emergency procedures during an escape.

After all miners and rescue personnel are outby the fire, a newspaper article about the event will appear on the screen. Point out how word of the "malfunctioning fire sensor" made its way into the story. Point out that ignoring the press will not stop a story from being written, it will just ensure that you will have no say about what goes into that story.

3.3. Conduct the debriefing

When the simulation ends you will have access to a printable trainer's log (Detailed instructions for accessing this feature are given in Volume 3: User's Manual.). This log is a chronological record of everything that happened during the simulation. The trainer's log includes events that occurred during the simulation and actions taken by the trainees. The notes are color-coded to distinguish between trainee actions and simulation events. This log is more helpful for debriefing than the emergency log described in section 3.1.4 because it includes information (such as the time the fire started) not previously available to the trainees.

You can concentrate on specific sections of the log to highlight the training objectives you set for that specific session. Since the log includes events not known to the trainees while running the simulation, such as the exact time the fire started to burn, you can discuss how long after such events happened that responses occurred. Following is a list, in no particular order, of possible trainee actions you may want to assess. Be sure to discuss whether or not the task was done, if it was done at the proper time, and if multiple tasks were completed in the optimal sequence.

- Call for EMS
- Call for mine rescue
- Assign someone to keep an emergency log
- Review Emergency Response Plan assignments
- Order response supplies, as needed
- Report the problem to corporate office
- Report the problem to the state mining agency
- Report the problem to MSHA
- Call police for traffic control and security
- Assign someone to front gate for security before police arrive
- Have someone keep a gate log
- Delegate the task of dealing with family members
- Delegate the task of dealing with media
- Delegate the task of dealing with rescue teams
- Have someone monitor the fan
- Ask that all non-emergency communication be stopped on the mine phone
- Have someone monitor the mine phone close to the problem for quick communications
- Account for all underground employees
- Decide what information should be included in media briefings
- Decide what information should be included in briefings to families of endangered miners
- Order food and water for the responders
- Create briefings for mine rescue teams
- Evacuate all miners inby the problem area
- Send miners to assist with underground response, if possible
- Evaluate gas readings, roof control conditions, etc. from problem area
- Anticipate condition of responders and plan for replacement
- Plan ventilation changes, if needed for response
- Call in additional personnel as needed
- Make lodging arrangements for responders if a long response is likely

There are, of course, multiple correct ways to address each run of the simulation. You will have to use your experience and expertise to determine the adequacy of the response for each run of the simulation. During the debriefing, it is also appropriate to have the trainees assess their own performance. With the advantage of hindsight and the organizing tool of the trainer's log, they may think of better alternatives or may teach each other why certain choices were or were not optimal. This type of group interaction is a valuable part of a MERITS training simulation and will improve the quality of the debriefing session. Be sure to highlight any actions taken or not taken that could create problems during real events. Remember to point out what was done well along with areas where improvement is needed.

4. MERITS Field Tests

During the summer and early fall of 2000, the MERITS program was field tested and produced promising results. Eight full-day training sessions were completed at four different locations in Pennsylvania, West Virginia and Colorado. The success of these sessions strengthened the belief in the viability of MERITS to serve as a unique tool for mine emergency management preparation. Research team members also learned things about trainee reactions during the simulation that could be helpful to trainers with less experience using this training tool. Some of these lessons are summarized later.

4.1. Trainee responses to MERITS

Field test trainees represented state government, union leadership, and private industry/production segments of the coal mining industry. Trainees had an average of 24 years mining experience. Twenty-two of the 27 trainees had participated in Mine Emergency Response Development (MERD) training exercises and many had been involved in real mine emergencies. Trainee responses from all eight field tests were extremely positive. At each session, trainees reported that this type of computer-based training is both challenging and useful. Even after saying how they thought specific aspects of MERITS could be improved, they stated that the overall MERITS session made them think about issues they had not thought of before [when dealing with a mine emergency]. Trainees completed a post-test questionnaire about their impressions of the MERITS training session. The following bullets present the responses from the 27 trainees who participated in the field tests.

- All 27 trainees said that the introduction was either very useful or useful in preparing them for the simulation.
- Twenty-five of the 27 trainees reported the storyline for the MERITS simulation was either very realistic or realistic.
- Twenty-six of the 27 trainees thought the MERITS simulation helped them know how to prepare for a real emergency.
- All 27 trainees reported the MERITS simulation helped them learn how to better handle a real emergency.
- None of the 27 trainees stated they were bored during the simulation.

4.2. Lessons learned from field tests

Once MERITS is started, it cannot be stopped until training is complete. Just like a real emergency, there are no breaks when the action starts. Since an average training session runs five hours or more, you need to schedule a MERITS session as a full day activity. Be sure to make arrangements prior to running the simulation for food to be brought in if the session might go through a mealtime.

You will need to remind trainees that MERITS runs in real time. During field testing, trainees often thought actions and decisions made should result in quicker responses than they did. For example, if the trainees called the police, they sometimes thought site security at the mine would be immediately in place. Actually, the police arrival was based on the time and distance needed to travel from the police station to the mine site. Trainees need to think ahead to have things done when they are needed and to efficiently use the down time while they are waiting.

Trainees get frustrated with their unfamiliarity with the names, job titles, and certifications of the mine personnel. You should encourage them by going through the various ways to get this information, pointing out the key players (like Jon Overton, the mine foreman), and explaining that the confusion will lessen as the session progresses. To some degree, the confusion helps set an appropriate level of anxiety for the session. It is also important for trainees to realize they may be asked to assist in an event at an

unfamiliar mine someday. If so, they will need to know how to deal with a lack of knowledge about the miners working there. Sorting through available information is an important emergency response skill.

MERITS is a simulation of a mine emergency, but there are some limitations to the program. For example, trainees cannot set up a check curtain because air and gas readings cannot be changed. When trainees want to take actions beyond the scope of the simulation, you should complete a freeform command so their decisions will be noted and can be reviewed during the debriefing. For details on program limitations see Volume 3: User's Manual.

Every MERITS session was in some way unique. Trainees continuously found new and innovative ways to respond to the problem. This allowed thorough testing of the software and sometimes led to software failure. But even when the software completely stopped operating and the run could not be resumed, the training session was not seen as a failure by trainers or trainees. After trainers told them how the story would end, trainees were happy to assess their performances to the point of software failure and to discuss what they might have done if the simulation could have continued. There are now recovery procedures built into the software and discussed fully in Volume 3: User's Manual. But if MERITS should fail and you cannot recover to the point of failure, do not give up on the class. A debriefing is still appropriate and trainees will remain ready to discuss and think about emergency response issues.

The Bottleneck #1 scenario is set in an underground coal mine. People who work at such operations or who may be asked to assist in a response at such an operation are the primary audience. However, some field test trainees were experienced miners from underground stone mines. While these individuals approached the problem somewhat differently than did the coal miners, they nevertheless responded effectively and reported that they found the training to be worthwhile.

5. In Conclusion

All of the MERITS field-test sessions were positive experiences for trainers, observers, and trainees. You should approach your session expecting the same for your class. MERITS is, however, a complex training tool. Allow plenty of time to prepare for your first sessions. It will become easier after you have some experience. Be sure to read Volume 3: User's Manual and have a complete understanding of how the interface works before attempting a formal training session. Don't be discouraged if it seems confusing at first, a few practice runs will improve your knowledge and confidence. If you find operating the keyboard to be difficult, find someone more comfortable with computers to input your responses the first time you work through the simulation. The perfect trainer team will have expert computer and emergency response skills. Perfection, however, is not needed for an excellent training experience - just a desire to succeed, coupled with preparation.

Job Aid for Setting Up for a MERITS Session

❑ Classroom is arranged so trainees can interact with each other, the trainer, and the keyboard operator and can see MERITS on the monitor or screen.

❑ Computer equipment is available and in working order.

❑ Internet connection is available.

❑ Copies of each of the following documents are available for each trainee:
- ♢ Mine Background
- ♢ Personnel (sorted alphabetically)
- ♢ Personnel (sorted by shift and usual work location)
- ♢ Roof Control Plan
- ♢ Ventilation Plan

❑ At least 2 copies of the Emergency Response Plan are available for the trainees.

❑ The following maps are on the wall for the trainees' review:
(printed on a wide-format plotter if possible)
- ♢ general map
- ♢ electrical map
- ♢ water map
- ♢ ventilation map
- ♢ escapeways map
- ♢ section map of 4 Left
- ♢ section map of 1 North

The following are available for trainees:
- ♢ pens
- ♢ pencils
- ♢ markers/highlighters
- ♢ paper
- ♢ a laser pointer

❑ Food/drinks have been arranged if needed.